

What is claimed is:

1. A cryogenically cooled apparatus for ablating tissue of a patient, comprising:
 - a handle portion;
 - 5 an elongated catheter extending distally from the handle, the elongated catheter being adapted to transmit a torque imparted by the handle;
 - a main shaft portion of the catheter having a substantially uniform diameter;
 - 10 a deflectable segment at the distal end of the main shaft, the deflectable segment having a minimum diameter that is smaller than the diameter of the main shaft;
 - a tip portion disposed distally of the deflectable segment and having a diameter greater than the minimum diameter, the tip portion
 - 15 defining an expansion chamber for refrigerant fluid;
 - a resilient component adapted to define a preferred plane of deflection of the deflectable segment; and
 - an actuator connected to a distal portion of the elongated catheter, adapted to impart a curvature to the deflectable segment.
- 20 2. The apparatus according to claim 1, wherein the resilient component is formed by stacked wires having a rectangular cross section, the smallest dimension of the rectangular cross section being in the stacking direction.
3. The apparatus according to claim 2, wherein successive ones of
- 25 the stacked wires are of decreasing length.
4. The apparatus according to claim 1, further comprising a capillary tube to transport refrigerant fluid from a refrigerant connection adjacent the handle to the tip portion.

5. The apparatus according to claim 2, wherein the stacked wires extend longitudinally along an inner surface of the deflectable segment.
6. The apparatus according to claim 1, wherein the tip portion is made of a heat conductive metal.
- 5 7. The apparatus according to claim 1, wherein the actuator is a pull wire linked to the tip portion at a distal end, and attached to a deflection control of the handle at the proximal end.
8. The apparatus according to claim 1, further comprising a tip union connecting the tip portion to the deflectable segment, the tip union
10 having a cylindrical shape, and a shaft union connecting the deflectable segment to a proximal portion of the main shaft.
9. The apparatus according to claim 8, further comprising a compression coil extending between the tip union and the shaft union, the compression coil resisting axial compression.
- 15 10. The apparatus according to claim 9, wherein the compression coil has a proximal portion having a higher pitch than the pitch of a distal portion of the compression coil.
11. The apparatus according to claim 1, further comprising a sheath union formed by a hollow cylinder having stepped diameters, the sheath union
20 extending through the shaft union and proximally from the shaft union.
12. The apparatus according to claim 11, further comprising a sheath attached to the sheath union, extending proximally to the handle, the sheath being formed of wire reinforced polymer shell, and being adapted to resist compressive loads.

13. The apparatus according to claim 12, wherein the actuator slidably extends through a lumen of the sheath union and through the sheath.

14. The apparatus according to claim 1, further comprising a sensor band adjacent to the tip, the sensor band being made of a conductive material, and sensor wires connected to the sensor band, extending proximally from the sensor band.

15. The apparatus according to claim 9, further comprising a flexible jacket encasing the compression coil, the flexible jacket being adapted to retain a circular cross section during deflection.

16. The apparatus according to claim 1, wherein the deflectable section has a diameter that varies longitudinally between the diameter of the elongated catheter and the minimum diameter.

17. The apparatus according to claim 16, wherein the deflectable section has a diameter equal to the elongated catheter diameter at a distal end and at a proximal end, and a diameter equal to the minimum diameter between the proximal and distal ends.

18. The apparatus according to claim 1, wherein the main shaft comprises a polymeric inner tube, a metal wire braid surrounding the inner tube, and an outer polymeric encasing the braid.

19. The apparatus according to claim 1, wherein the resilient component is connected to the elongated catheter at a first circumferential position, and the actuator is connected to the elongated catheter at a second circumferential position, diametrically opposite to the first circumferential position.

20. A deflatable catheter for surgical applications, comprising:
a main shaft portion of the catheter having a substantially uniform diameter;
a deflatable segment of the catheter, the deflatable segment having a minimum diameter that is smaller than the diameter of the main shaft;
a tip portion of the catheter disposed distally from the deflatable segment, the tip portion having a diameter greater than the minimum diameter;
a resilient component adapted to define a preferred plane of deflection of the deflatable segment; and
an actuator linked to the tip portion of the catheter, adapted to impart a curvature to the deflatable segment.
21. The catheter according to claim 20, wherein the resilient component is formed by stacked flat wires having a rectangular cross section, the smallest dimension of the rectangular cross section being in the stacking direction.
22. The catheter according to claim 21, wherein a base wire of the flat wires is disposed longitudinally along an inner surface of the deflatable segment, and successive wires are stacked radially on the base wire.
23. The catheter according to claim 20, wherein the actuator is a pull wire linked to the tip portion and extending proximally from the tip portion.
24. The catheter according to claim 20, wherein the actuator is linked to an inner surface of the tip portion at a location diametrically opposite to the resilient component.

25. The catheter according to claim 20, further comprising a compression coil extending along the deflectable section, the compression coil resisting axial compression.

26. A cryocatheter with a deflectable tip for use in surgical applications which comprises:

a main shaft portion having a substantially constant first diameter (d_1);

a tip portion having a substantially same first diameter (d_1);

a deflectable segment interconnecting said main shaft portion with said tip portion, said deflectable segment having a distal end connected to said tip portion and a proximal end connected to said main shaft portion with a mid point therebetween, said deflectable segment having a second diameter (d_2) at the midpoint wherein said second diameter is less than said first diameter ($d_1 > d_2$);

a resilient component mounted in said deflectable segment adapted to define a preferred plane of deflection for said deflectable segment; and

an actuator mounted on said main shaft portion and connected to said tip portion to move said tip portion through a range in the preferred plan of deflection between a first configuration wherein said tip portion is substantially coaxial with said main shaft portion and a second configuration wherein said tip portion is approximately parallel with said main shaft portion.